



AUTOMAKERS LOOK TO REPEL CHINA'S MAGNETS

India's electric vehicle industry is trying to find sustainable long-term solutions to its rare earth magnet crisis

Ayaan Kartik
ayaan.kartik@livemint.com
NEW DELHI

On Monday, VinFast, a subsidiary of Vingroup JSC, a large Vietnamese conglomerate, opened its electric vehicle (EV) plant in Thoothukudi, Tamil Nadu. The pure-play EV maker will use the plant to assemble its vehicles, and is expected to invest ₹16,000 crore on the facility in phases.

VinFast makes everything from e-scooters to e-buses, and will initially use the facility for the Indian market. The company has opened bookings for two of its premium electric SUV models: VF 6 and VF 7. The Thoothukudi plant will also serve as an export hub for the company.

Unlike its Indian rivals, VinFast, presumably, will not face any issues on the rare earth magnet front as it will only assemble EVs at the Thoothukudi plant. The company sources its rare earth magnets from South Korea's Star Group Industrial (SGI), according to *Reuters*. The news agency had reported earlier that SGI is investing in a factory in Vietnam to produce these magnets, specifically for VinFast and Hyundai. Vietnam has the world's second largest reserves of rare earths.

While news of its India debut has been in the ether for a while now, VinFast's entry is unlikely to see executives at Tata Motors, Mahindra and Mahindra, and other Indian EV makers break out the bubbly. India's EV makers have been on the backfoot because of the rare earth magnet crisis triggered by China, which has put a giant question mark over the future of their assembly lines. The entry of a rival that does not face a rare earth problem is not the sort of news that will set their pulses racing.

Putting on a brave face, seasoned leaders across two and four-wheeler companies had a stock response ready when they were asked about the rare earths crisis during their post results call at the end of July: "The situation is manageable as of now."

TVS' director and chief executive officer (CEO) K.N. Radhakrishnan told investors that the company is "managing day-to-day operations". Maruti Suzuki's Rahul Bharti, senior executive officer of corporate affairs, acknowledged it is a challenge engineers are working to address. The leadership of Mahindra and Hyundai, meanwhile, stressed that the situation had no bearing on the coming months.

THRUST INTO THE LIMELIGHT

Although they have been used widely since the 1990s, few people outside the automotive engineering field knew about the critical role rare earths play in propelling automobiles.

It was Japanese giant Toyota that first put rare earth magnet motors on the radar when it introduced its famous Prius model during the 1990s. In an instant, this turned out to be a game-changing technology.

Rare earth magnets are critical components in electric vehicles due to their energy efficiency, and compact size, which enable motors to deliver a peak performance. An EV's motor drives it forward by converting electrical energy received from the battery into mechanical energy. Aside from traction motors, these magnets go into everything from power steering systems, to braking systems, to wind-screen wiper motors in EVs and internal combustion engine vehicles.

The global rare earth magnet market was valued somewhere around \$11 billion in 2022. Despite this, for years, the role these magnets played and India's dependence on China to source them, went unnoticed. Annual reports of companies certainly did not cite them as a key risk that could one day bring production to a grinding halt.

That changed in April, when China imposed export restrictions on seven rare earth elements, retaliating against the 145% tariffs the US had slapped on it. Today, nearly everyone tracking the automobile sector is keenly aware of the role rare earth elements play in keeping EV assembly lines in motion.

While the US-China spat escalated the trade war between the two sides, other countries, including India, also bore the brunt. China has the world's largest reserves and is estimated to control over 90% of global production of rare earth motors. That dominance and outright dependence has put India in an awkward position—given that no one of sound mind would describe relations between the two countries as warm.

Overnight, the curbs threatened to derail the central government's ambitions of making India an electric vehicle manu-



A worker at VinFast's electric vehicle plant in Thoothukudi, Tamil Nadu. The company reportedly sources its rare earth magnets from South Korea's Star Group Industrial.

AP

facturing hub, an aspiration on which it has bet over ₹60,000 crore through various promotion schemes over the last six years. For Indian EV makers, they pose an existential threat.

"Companies have started importing full motors or some parts of them. Others are looking to route from European suppliers who have access to Chinese magnets," said an industry executive working with original equipment manufacturers (OEMs). "They have solutions in place right now, but nobody has very clear answers," the person added.

Policymakers, auto sector executives, and anxious stock market investors—are now wondering what lies beyond.

Mint spoke to automobile manufacturers, industry executives and observers to put together this piece on how the sector is trying to beat the crisis and find sustainable long-term solutions.

BACK TO BASICS

When adversity strikes, the first instinct is to find answers in what was done in the past. And in the past, there were no magnets. There were induction motors.

Among the known names, Ola Electric has taken the lead in introducing rare earth-free motors. Development of these motors is at an advanced stage, it claims.

Such motors use a stator and a rotor to produce magnetic field unlike rare earth magnet motors which use magnets to produce the field.

Ravi Pandit and his team at KPIT Technologies, a Pune-based engineering research and development team working with auto companies, have been quietly working on improving this old school technology.

Usage of induction motors, however, increases the weight of the vehicle as it's larger and heavier in size. That's the biggest challenge.

"We tested motors extensively, and we have come up with the first one, which is really very appropriate for anything of a public transport nature," said Pandit, chairman and co-founder of the company. Heavy-duty vehicles such as trucks and buses can introduce such technology without having to worry about small additions to the weight of the vehicles, he explained.

The company claims to have matched the performance of rare earth magnets.

"We are now working with various OEMs in the country to do it across the

range," said Pandit. Which is, expand adoption of induction motors from two-wheelers to four-wheelers.

While some OEMs are ready to trust old technology again, others are putting their faith in their engineers to find a different solution.

RARE EARTH-FREE MAGNETS

Since the crisis began in April, some start-ups and auto component companies have also begun looking to use ferrite magnet motors, which do not use rare earth elements.

Ankit Somani, co-founder of Conifer, a ferrite magnet-based motor maker, flew down from California to seek opportunities here. The company has set up a plant in Pune to make such motors.

Ferrite is a magnetic material mainly composed of iron oxide and other metal oxides.

"Ferrite magnet motors are generally weaker than rare-earth magnets. However, we have figured out a way to have better efficiency and performance than rare earth magnets," Somani said. "We have developed in-wheel motors that perform much better than the hub motors being used in vehicles right now."

With the requirement of power much lower in two-wheelers, the use of ferrite magnet motors is said to be under consideration at most of the top brands making electric scooters and bikes.

Among the known names, Ola Electric has taken the lead in introducing rare earth-free motors. During the company's investor call on 14 July, founder Bhavish Aggarwal informed shareholders that development of these motors is at an advanced stage.

"Our rare earth-free motor is something we started developing more than a year or two back. And some of you who visited our factory a year ago would have seen this. In fact, we were quite transparent about it," Aggarwal said.

"Then people thought that we were just showing it casually, but now it's happening for real," he explained.

GOING LIGHT

While one strand of the industry is working on eliminating rare earths from the motors, others are backing the use of light rare earths, whose supply has not been restricted by China.

Rare earths are divided into two categories—heavy and light. Heavy rare earth

mint SHORT STORY

WHAT

China's curbs on rare earth magnets are threatening India's ambitions of becoming an EV manufacturing hub. The auto industry is now trying out alternative solutions.

NOW

While one strand of the industry is working on eliminating rare earths from the motors, others are backing the use of light rare earths, whose supply has not been restricted.

BUT

Several technologies are showing potential. However, there will still be questions over their viability until the vehicles they power hit the road and customers embrace them.

magnets are used in electric vehicles which require higher power such as cars and motorcycles. Using light rare earths, such as Cerium and Neodymium, is a quicker solution, say analysts, noting that new motor architecture takes a lot of time to be tested and certified ready for use.

Sona Comstar, the country's eighth largest component maker, has already developed motors using light rare earth and is in the process of testing the new motors.

Vivek Vikram Singh, managing director and group chief executive of Sona Comstar, said that light rare earth solutions can be used in the medium term by two- and three-wheeler makers, and even small car manufacturers, as they require less power to run.

"[But] all these alternative motors would require months of testing and validation with customers before commercial production can begin," Singh said in response to *Mint's* queries.

"In the short term, there is no alterna-

THE ALTERNATIVES

Automakers are experimenting with old and new technologies to overcome the rare earth magnet crisis.

Induction motor

Advantage

An old and trusted technology; components are available in abundance with no concentration of supply

Disadvantage

Previous versions of the tech were less efficient as it couldn't produce enough magnetic strength. Heavier and larger in size, which affects performance of vehicles

Ferrite magnet motor

Advantage

Ferrite is available in abundance; India has a large supply. With tweaks, it can perform well in two and three-wheelers

Disadvantage

Has lower magnetic strength and is not able to perform well at higher temperature, crucial in countries like India

Light rare earth magnet motor

Advantage

China has not restricted supply of light rare earths. It has a more diversified supply chain than heavy rare earth magnets

Disadvantage

The magnetic strength is not comparable to heavy rare earths. High demand can cause disruptions and price hikes

Source: Mint research
GOPAKUMAR WARRIER/MINT

Industry experts and executives say rare earth magnets will not go out of the picture completely. And until they do, the industry will have to figure out a way to get supplies of this critical component.

SHORT-TERM HEADACHE?

Although the challenge to figure out viable solutions has been hard, there are expectations that the industry will have alternate technologies ready in the next two years.

"With the pace of development of new technologies and investments being put in, the industry will have solutions ready soon. The dependence on rare earths will eventually reduce in the medium term as the development of the alternative methods is quite advanced," said Subhabrata Sengupta, partner at Avalon Consulting.

The country is also working on securing alternative supply chains for critical minerals and developing processing capabilities for rare earth magnets. Since 1950, state-run IREL Ltd has been mining rare earths in the country, and since the crisis began, it has gained the spotlight for its efforts to mine rare earths.

Indeed, India is attracting international interest on this front. Japanese company Proterial, formerly known as Hitachi Metals, is looking to set up a rare earth magnet plant in India, according to two people aware of the matter. The company wants to source rare earth ores and oxides from within the country and outside to process Neodymium Ferrite Boron (NdFeB) magnets, one of the strongest forms of rare earth permanent magnets.

Hindustan Zinc and Gujarat Mineral Development Corporation (GMDC) are among the domestic companies that have expressed interest in mining and processing rare earths. On its part, the government is currently finalising details of a ₹1,345 crore programme to promote the development of rare earth magnets.

From mining players to automobile companies, there is a rush to find a solution to the China dependency. While several technologies are showing potential, there will still be questions over their viability until the vehicles they power hit the road and customers embrace them.



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